CIVENG 2004
Fluid Mechanics
Lectures: TuThFr 11:30 am – 12:20 pm
Tutorials: Mo 10:30 am – 12:20 pm / Th 12:30 pm – 2:20 pm
Laboratory: Th 8:30 am – 11:20 am

Instructor
Dr. Benzhong Zhao (robinzhao@mcmaster.ca)
Office Location: JHE-336
Office Hours: TBD

Teaching Assistants
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Course Description
This is an introductory course on the fundamental principles of fluid mechanics. By the end of the course, students should have a good intuition of fluid flow in simple geometries and be able to solve fluid problems mathematically using conservation of mass, momentum and energy. In addition to analytical approaches, we will introduce empirical models that are sometimes necessary to solve fluid flow in complex geometries.

Additional Reading
All required course material will be included in the course notes and lecture slides, but the following additional reading is recommended:


Course Objectives and Learning Outcomes
The goals are to develop an understanding of the basics of fluid motion and an ability to analyze flow commonly encountered in civil engineering. Upon completion, the student will have:

- the competence in the specialized engineering knowledge of fluid mechanics (*Attribute 1.4*)
- the ability to identify reasonable assumptions (including identification of uncertainties and imprecise information) that could or should be made before a solution path is proposed (*Attribute 2.1*)
- the ability to manage time and processes effectively, prioritizing competing demands to achieve personal and team goals and objectives (*Attribute 6.1*)
- the competence to construct effective written arguments (*Attribute 7.3*)

Teaching Approach
The topics in this course will be presented in a traditional lecture format, with emphasis on developing physical intuition and mathematical competancy. Students are expected to attend and actively participate in the lectures. Tutorials will be used to review and practice key concepts presented in the lectures.
Laboratory Component
Part of the course requirement is attending and reporting on laboratory assignments in a team environment. Each laboratory team will consist of a maximum of 5 students. The experiments will cover the following topics:

- Pressure forces on surfaces (Lab 1)
- The Bernoulli equation (Lab 2)
- Linear-momentum (Lab 3)
- Hydraulic jump (Lab 4)

Each team is responsible to submit one typed laboratory report that should be concise, as accurate as possible, clear, and consist of the following parts:

- Objective(s)
- Experimental apparatus (photos or/and sketches if necessary)
- Experimental procedure
- Relevant theory (assumptions, formulae, etc.)
- Conclusions and discussion

Evaluation and Grading
Final grades will be converted to the twelve-point letter grade system using the standard conversion scale. Your final grade will be based on:

- Homework assignments — 4% each, 20% total
- Laboratory reports — 5% each, 20% total
- Class participation — 10%
- Midterm exam — 20%
- Final exam — 30%

To pass the course, students must complete and pass the exam portion of the course. Specifically, the weighted-average of the midterm and final exam grade must be above 50%. If a student misses the midterm due to any reason, a make-up midterm will be scheduled.

Course Policies

- General
  1. Attendance at all course activities (classes, labs, tutorial sessions, exams) is mandatory.
  2. Phones may not be used during classes, tutorials, labs, or exams. Turn them off beforehand and put them away.

- Academic Integrity
  You are required to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

  Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences,
e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism. e.g. the submission of work that is not one’s own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

- Protection of Privacy Act (FIPPA)
The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and the posting of grades must be done in a manner that ensures confidentiality - see http://www.mcmaster.ca/univsec/fippa/fippa.cfm

- Academic Accommodation of Students with Disabilities Policy
Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) https://sas.mcmaster.ca/ to make arrangements with a Program Coordinator. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University's https://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf

- Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)
Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar’s Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

- Requests for Relief for Missed Academic Term Work – MSAF
The McMaster Student Absence Form is a self reporting tool for Undergraduate Students to report absences that last up to 5 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period.

You may submit a maximum of 1 Academic Work Missed requests per term. It is YOUR responsibility to follow up with your Instructor immediately regarding the nature of the accommodation.

If you are absent more than 5 days or exceed 1 request per term you MUST visit your Associate Dean’s Office (Faculty Office). You may be required to provide supporting documentation.
This form should be filled out immediately when you are about to return to class after your absence. http://www.mcmaster.ca/msaf/

• **Anti-Discrimination**
  The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible. https://www.mcmaster.ca/policy/General/HR/Discrimination_and_Harassment.pdf

• **Extreme Circumstances**
  The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

• **Online Access**
  In this course we will be using *Avenue to Learn*. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

• **University Statement on Changes to the Course**
  The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

• **Homework Assignments and Labs**
  1. Late assignments will not be accepted. Accommodation will only be given to missed assignments with a proper McMaster Student Absence Form (MSAF).
  2. You are required to participate in all laboratory sessions. The lab will be completed in a pre-assigned group, but the data analysis and report writing will be done on an individual basis.
  3. A hard copy lab report is due one week after the lab session by 12:30 pm.

• **Health & Safety**
  The Faculty of Engineering is committed to McMaster University’s Workplace and Environmental Health and Safety Policy which states: “Students are required by University policy to comply with all University health, safety and environmental programs”. It is your responsibility to understand McMaster University Workplace and Environmental Health and Safety programs and policies. For information on these programs and policies please refer to McMaster University Environmental and Health Support Services Occupational Safety Risk Management Manual (link). It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory
equipment. The labs will take place either in the soil’s lab (JHE 114) or the Applied Dynamics Building. The following rules are to be observed:

1. Glasses or safety glasses/goggles must be worn in the lab at all times.
2. Contact lenses are not to be worn in the lab.
3. No loose clothing allowed.
4. Closed-toed shoes must be worn at all times.
5. Long hair must be tied back.

Students not abiding by these safety requirements will be given one warning. Second offences will result in the student being asked to vacate the laboratory, and receiving a grade of zero for that particular lab.
## Course Outline (Tentative):

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